MARINE BIOLOGY AT PORT ERIN.

THE annual report of the Marine Biological Station at Port Erin, Isle of Man, being the twenty-third annual report of the Liverpool Marine Biology Committee, has just been published, and it may be of interest to refer briefly to some of the features of a successful year's work. The station appears to have been more active than ever this last year, and the record of work indicates that researches of a most varied nature have been carried out.

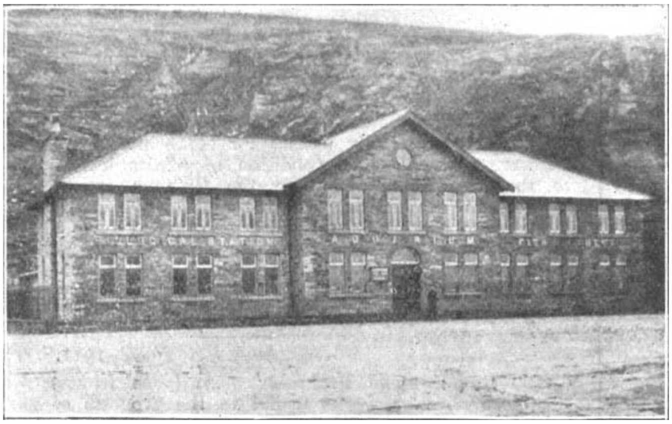

Fig. 1.—The Biological Station at Port Erin

The adjoining fish hatchery (the expenses of which are met by the Isle of Man Fishery Board) has been employed, as usual, in the hatching of plaice eggs, and a total of 7,124,500 larvæ were liberated in the open sea. Some of the eggs have been used for experimental purposes, and a series of extremely good photographs, taken by Dr. F. Ward, and illustrating various stages of the larvæ from the time of hatching until metamorphosis had begun, are included in the report. The number of workers who occupied tables in the laboratory is forty, of whom twenty were senior students of the Liverpool University attending an Easter class in marine biology, which has now become an annual fixture. As a matter of fact, the station is usually crowded during the Easter vacation, and a visitor would be struck immediately by the number of people taking advantage of the laboratory, and by the economical way in which the work is carried out. More than one foreign professor of zoology has been surprised, on learning the finances of the Biological Station, that the place could be kept going with active workers there at all, for it must be remembered that this is not a laboratory subsidised by Government or county council, but depending for the main part of its income upon the voluntary contributions of those interested in the work.

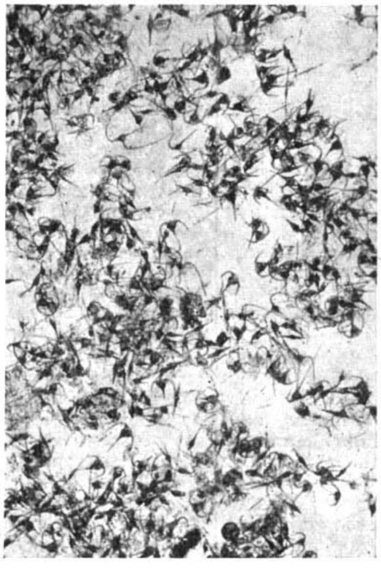

Fig. 2.—Plankton consisting mainly of *Ceratium tripos*.

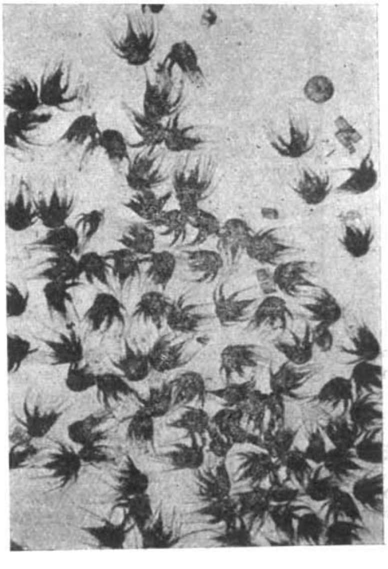

Fig. 3.—Plankton catch consisting almost entirely of *Balanus nauplii*.

In addition to the report of the curator (Mr. Chadwick) are minor reports on some of the research work, including statements of Mr. W. J. Dakin's work on the sense organs of Mollusca, Mr. F. H. Gravely's studies on the polychæte larvæ, and Dr. Roaf's researches on the digestive processes in marine Invertebrata—histological, biochemical, and faunistic work being thus represented. An article by Prof. W. A. Herdman on "Our Food from the Sea" completes the report, and alludes to the scope of the quantitative plankton investigation, which has been one of the features of Port Erin work. The article is illustrated by some photographs of practically pure plankton catches, of which two are reproduced here (Figs. 2 and 3).

No doubt many scientific workers in other branches of zoology who have not considered this quantitative plankton work in detail still hold more or less to Haeckel's view—that time is being lost by using methods which are inaccurate, based upon principles which are impossible. It may be useful, therefore, to consider some of these points here, for a report of this kind brings one up against the question of the practicability and value of quantitative plankton research. During the last few years the number of workers studying the plankton of fresh and salt water has greatly increased, and some of the most remarkable problems in marine biology have been shown to be bound up in plankton questions. I might refer, in the first place, to Pütter, who but a short time ago propounded certain startling theories concerning the food of marine organisms. According to this author the planktonic organisms are insufficient to provide for the wants of many marine animals which can only obtain their food from filtered sea water, and he asserts that the latter is in itself a nutrient fluid.

Many facts, both biological and chemical, have been brought forward against these theories, but, whether correct or not, Pütter has shown the need of further research and the importance of the problem of animal metabolism in the sea. The actual food requirements of the animals must be determined by physiological and biochemical methods, and quantitative plankton methods alone will show whether the plankton can supply the demands made by the physiologist. The total plankton present at any time is the result of a series of processes—productive and destructive—and it is important to know how the volume or quantity varies.

No qualitative work will show the seasonal, or even daily, variation in the volume of the plankton, though it may indicate the specific change. The interest in such problems is immediately aroused when catches with a certain net, after averaging a few cubic centimetres in volume, suddenly rise to 40 cubic centimetres, remain there for a period, and then as suddenly fall to about 1 c.c. or 2 c.c. for the summer season, and this is a characteristic annual change observed in the Irish and Baltic Seas. What determines these changes in volume? When do they

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occur? Is there a relation between the times of maxima of different groups of plants or animals? We can hardly look to qualitative plankton work for the answers, and it has been the quantitative methods that have mapped out the spring maxima of diatoms and dino-flagellates, and, in opposition to qualitative results, have shown how in temperate and arctic regions the plankton is greater in volume than in the tropics.

Again, in order to show whether the changes in the plankton are due to inherent qualities in the organisms, to external influential hydrographical conditions, or to both, a combination of hydrographic and planktonic work is required. It is, I think, obvious that there are many problems awaiting solution, and our choice is limited to the alternative of either leaving them alone or adopting quantitative methods.

It has been said that the latter are inaccurate. Of course they are, to a certain extent, but unfortunately we have no better at our disposal, and have considered it better to use the most accurate methods possible, and to remember the error when drawing our conclusions, than to leave the whole question alone. It is significant that all the objections, backed by scientific evidence, which have been brought against the quantitative methods have come from investigators using these methods. It is obvious, therefore, that their eyes are open to the defects of the methods and the limits of the apparatus used. In this respect may be mentioned the work of Lohmann and Kofoid on the catching power of the nets (Fig. 4), and of Herdman in regard to the variations in uniformity in the distribution of the plankton, which question was the first to be considered in the Port Erin work. I cannot do better than quote certain lines from the article in the report referred to:—"With the object of formulating such views as to the nature of the Plankton at any particular time, and as to the changes, both diurnal and seasonal, and the determining factors of such changes, we must endeavour to make quantitative catches as accurately and as frequently as possible, so that our samples may be as nearly representative and as nearly comparable one with another as the difficult conditions will admit. These catches should be made with standard nets, should be preserved and measured according to a uniform system, and may then be compared in bulk; but, in addition, the more important organisms should be counted approximately, and the results in round numbers may be used in comparing catches or tracing changes; but such figures should not be made the basis of calculations as to the total numbers of such organisms in the oceans." The last sentence cannot be too strongly emphasised; the quantitative method is *not* used with the object of determining the number of diatoms in the Irish Sea, and *comparisons* of figures obtained in a uniform way should be the feature of the system.

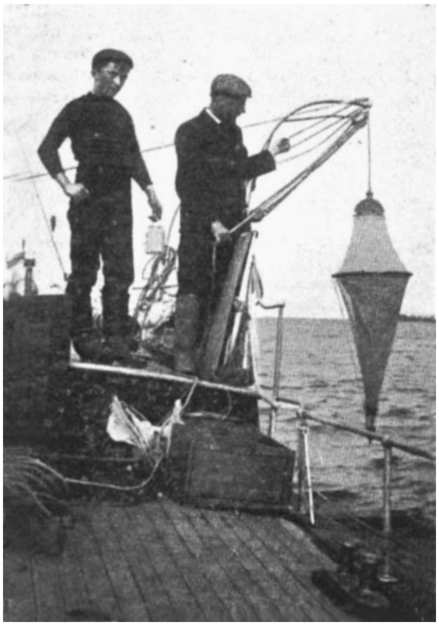

FIG. 4.—The Closing Petersen-Hensen Net going down open.

It would be of great value if some system could be arranged so that plankton catches made in a uniform manner could be taken in different parts of the Irish Sea and St. George's Channel simultaneously. This would greatly help in mapping out the distribution of the plankton and tracing the course of the maxima. For example, in July last, after weeks' of catches containing a normal and small number of various copepoda, echinoderm larvæ, &c., the nets one day were found to contain large masses of *Calanus helgolandicus*. The catches were almost pure, and, in fact, practically useless for the echinoderm larvæ that were wanted. This condition of affairs lasted from two to three days, and then the Calanus swarm disappeared as mysteriously as it came. Systematic and simultaneous catches in the Irish Sea would have shown over what area this Calanus swarm extended, and perhaps whence it came.

W. J. DAKIN.

PRIZES PROPOSED BY THE PARIS ACADEMY OF SCIENCES FOR 1911.

GEOMETRY.—The Francœur prize (1000 francs), for discoveries or works useful to the progress of pure or applied mathematics; the Bordin prize (3000 francs), for improving at an important point the theory of triple systems of orthogonal surfaces; the Poncelet prize (2000 francs), for work in applied mathematics.

Mechanics.—A Montyon prize (700 francs), for the invention or improvement of instruments useful to the progress of agriculture, the mechanical arts or sciences; the Vaillant prize (4000 francs); the subject for 1909, postponed to 1911, is to improve the application of the principles of the dynamics of fluids to the theory of the helix, and the question proposed for 1911 is to perfect at some point the study of the motion of an ellipsoid in an indefinite liquid, having regard to the viscosity of the liquid.

Navigation.—The extraordinary prize of 6000 francs, for work tending to increase the efficiency of the French naval forces; the Plumey prize (4000 francs), for improvements in steam engines or for any other invention which would contribute to the progress of steam navigation.

Astronomy.—The Lalande prize (540 francs), for the most interesting observation, memoir, or work useful to the progress of astronomy; the Valz prize (460 francs), for the most interesting astronomical observation made during the current year; the G. de Pontécoulant prize (700 francs); the Damoiseau prize (2000 francs), subject postponed from 1909, the theory of the planet Eros based on known observations, and for 1911, to perfect the "Tables de Jupiter" of Le Verrier.

Geography.—The Tchihatchef prize (3000 francs), for a recompense or encouragement for exploration of the unexplored or partially explored portions of Asia; the Gay prize (1500 francs), for the study of a French African colony from the geological point of view (Algeria and Tunis excepted).

Physics.—The Hébert prize (1000 francs), for a discovery in applied electricity; the Hughes prize (2500 francs), for a discovery or work contributing to the progress of physics; the Gaston Planté prize (3000 francs), for an important invention, discovery, or work in the field of electricity.

Chemistry.—The Jecker prize (10,000 francs), for work in organic chemistry; the Cahours prize (3000 francs), for the assistance of young chemists already known by their original chemical researches; Montyon prizes (unhealthy trades) (2500 francs and a mention of 1500 francs), for a discovery of a means of rendering an art or trade less unhealthy.

Mineralogy and Geology.—The Delesse prize (1400 francs); the Joseph Labbé prize (1000 francs), for geological works or researches leading to effective development of the mining wealth of France, its colonies or protectorates; Fontannes prize (2000 francs), to the author of the best palæontological publication.

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